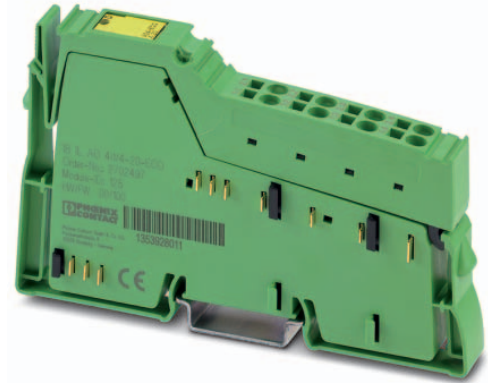


IB IL AO 4/I/4-20-ECO

**Inline ECO, analog output terminal,
analog outputs: 4, 4 mA ... 20 mA,
connection technology: 2-conductor**



Data sheet
107263_en_01

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1 Description

The terminal is designed for use within an Inline station. It is used to output analog current signals.

The output values are depicted in standardized representation format.

Inline ECO terminals are approved for the temperature range from 0°C to +55°C. The electronics base and Inline connector are supplied as standard.

Features

- 4 analog output channels
- Connection of actuators in 2-wire technology
- Current range: 4 mA ... 20 mA
- Data format: standardized representation
- Resolution: 12 bits
- Diagnostic indicator



This data sheet is only valid in association with the IL SYS INST UM E user manual.



Make sure you always use the latest documentation. It can be downloaded from the product at phoenixcontact.net/products.

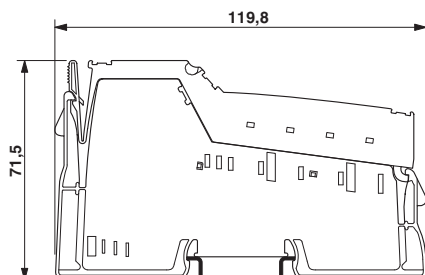
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3 Ordering data

| Description | Type | Order No. | Pcs./Pkt. |
|---|-----------------------|-----------|-----------|
| Inline ECO, Analog output terminal, Analog outputs: 4, 4 mA ... 20 mA, Connection method: 2-wire, Transmission speed in the local bus 500 kbps, Degree of protection IP20, including Inline connector | IB IL AO 4/I/4-20-ECO | 2702497 | 1 |
| Accessories | Type | Order No. | Pcs./Pkt. |
| Shield connection clamp, for shield on busbars, contact resistance < 1 mΩ (Assembly) | SK 8 | 3025163 | 10 |
| Shield connection clamp, for shield on busbars, contact resistance < 1 mΩ (Assembly) | SK 14 | 3025176 | 10 |
| Shield connection clamp, for shield on busbars, contact resistance < 1 mΩ (Assembly) | SK 20 | 3025189 | 10 |
| Shield connection clamp, for shield on busbars, contact resistance < 1 mΩ (Assembly) | SK 35 | 3026463 | 10 |
| Support bracket for busbars (Assembly) | AB-SK | 3025341 | 10 |
| Support bracket, Bracket for busbars, set every 20 cm, Length: 95.5 mm, Width: 6.2 mm, Color: gray (Assembly) | AB-SK 65 | 3026489 | 10 |
| Support bracket, Bracket for busbars, set every 20 cm, Length: 10 mm, Width: 56 mm, Height: 20 mm, Color: silver (Assembly) | AB-SK/E | 3026476 | 10 |
| PEN conductor busbar, 3mm x 10 mm, length: 1000 mm (Assembly) | NLS-CU 3/10 SN 1000MM | 0402174 | 10 |
| Connection terminal block, Connection method Screw connection, Cross section: 0.5 mm ² - 6 mm ² , Width: 7 mm, Color: silver | AK 4 | 0404017 | 50 |
| Connection terminal block, Connection method Screw connection, Cross section: 0.5 mm ² - 6 mm ² , Width: 7 mm, Color: green-yellow | AKG 4 GNYE | 0421029 | 50 |
| Connection terminal block, Connection method Screw connection, Cross section: 0.5 mm ² - 6 mm ² , Width: 7 mm, Color: black | AKG 4 BK | 0421032 | 50 |
| Connector, for digital 1, 2 or 8-channel Inline terminals (Connector/Adapter) | IB IL SCN-8 | 2726337 | 10 |
| Labeling field, width: 12.2 mm (Marking) | IB IL FIELD 2 | 2727501 | 10 |
| Documentation | Type | Order No. | Pcs./Pkt. |
| User manual, English, Automation terminals of the Inline product range | IL SYS INST UM E | - | - |
| Data sheet, English, INTERBUS addressing | DB GB IBS SYS ADDRESS | - | - |

4 Technical data

Dimensions (nominal sizes in mm)



| | |
|--------|----------|
| Width | 12.2 mm |
| Height | 119.8 mm |
| Depth | 71.5 mm |

General data

| | |
|--|---|
| Color | green |
| Weight | 60 g (with connector) |
| Ambient temperature (operation) | 0 °C ... 55 °C (see "Derating" table in the data sheet) |
| Ambient temperature (storage/transport) | -25 °C ... 85 °C |
| Permissible humidity (operation) | 10 % ... 95 % (according to DIN EN 61131-2) |
| Permissible humidity (storage/transport) | 10 % ... 95 % (according to DIN EN 61131-2) |
| Air pressure (operation) | 70 kPa ... 106 kPa (up to 3000 m above sea level) |
| Air pressure (storage/transport) | 70 kPa ... 106 kPa (up to 3000 m above sea level) |
| Degree of protection | IP20 |
| Protection class | III, IEC 61140, EN 61140, VDE 0140-1 |

Connection data

| | |
|--|---|
| Designation | Inline connector |
| Connection method | Spring-cage connection |
| Conductor cross section solid / stranded | 0.08 mm ² ... 1.5 mm ² / 0.08 mm ² ... 1.5 mm ² |
| Conductor cross section [AWG] | 28 ... 16 |
| Stripping length | 8 mm |

Interface Inline local bus

| | |
|--------------------|--------------------|
| Number | 2 |
| Connection method | Inline data jumper |
| Transmission speed | 500 kbps |

Inline potentials / Power consumption

| | |
|------------------------------------|--------------------------|
| Communications power U_L | 7.5 V DC |
| Current consumption from U_L | typ. 40 mA |
| I/O supply voltage U_{ANA} | 24 V DC |
| Current consumption from U_{ANA} | typ. 65 mA max. 85 mA |
| Power consumption | typ. 1.8 W max. 1.9 W |

Analog outputs

| | |
|--|-----------------------------|
| Number of outputs | 4 |
| Connection method | 2-wire |
| Note regarding the connection technology | Shielded, twisted pair |
| Current output signal | 4 mA ... 20 mA |
| D/A resolution | 12 bit |
| Representation of output values | 16 bits |
| Data formats | Standardized representation |
| Process data update | < 10 ms |
| Load/output load current output | < 300 Ω |
| Precision | typ. 0.1 % max. 0.3 % |
| Short-circuit and overload protection | Electronic |
| Transient protection | Suppressor diode |

Programming Data

| | |
|-------------------------|--------|
| ID code (hex) | 7D |
| ID code (dec.) | 125 |
| Length code (hex) | 04 |
| Process data channel | 64 Bit |
| Input address area | 0 Byte |
| Output address area | 8 Byte |
| Parameter channel (PCP) | 0 Byte |
| Register length (bus) | 64 Bit |

Configuration and parameter data in a PROFIBUS system

| | |
|-----------------------------|--------|
| Required parameter data | 1 Byte |
| Need for configuration data | 4 Byte |

Error messages to the higher level control or computer system

| | |
|------------------------------------|---|
| Failure of the internal I/O supply | I/O error message sent to the bus coupler |
| Checksum error | I/O error message sent to the bus coupler |

Electrical isolation/isolation of the voltage areas

| Test section | Test voltage |
|---|-------------------------|
| Bus logic (local bus, communications power) | 500 V AC, 50 Hz, 1 min. |
| Analog I/O | 500 V AC, 50 Hz, 1 min. |
| Functional earth ground | 500 V AC, 50 Hz, 1 min. |

Conformance with EMC Directive 2014/30/EU**Noise immunity test in accordance with EN 61000-6-2**

| | |
|--|--|
| Electrostatic discharge (ESD) EN 61000-4-2/ IEC 61000-4-2 | Criterion B, 6 kV contact discharge, 8 kV air discharge |
| Electromagnetic fields EN 61000-4-3/IEC 61000-4-3 | Criterion A, Field intensity: 10 V/m |
| Fast transients (burst) EN 61000-4-4/IEC 61000-4-4 | Criterion B, 2 kV |
| Transient overvoltage (surge) EN 61000-4-5/ IEC 61000-4-5 | Criterion B, supply lines DC: ± 1 kV/ $\pm 0,5$ kV (symmetrical/ asymmetrical), shielded I/O cables: ± 1 kV |
| Conducted interference EN 61000-4-6/IEC 61000-4-6 | Criterion A; Test voltage 10 V |

Noise emission test according to EN 61000-6-3

| | |
|--|---------|
| Radio interference properties EN 55022 | Class A |
|--|---------|

Approvals

For the latest approvals, please visit phoenixcontact.net/products.

5 Additional technical data

5.1 Derating

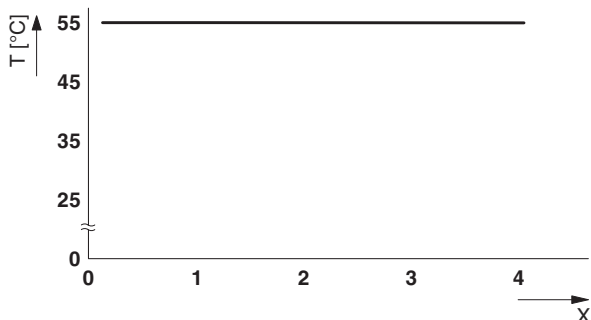


Figure 1 Derating with active convection

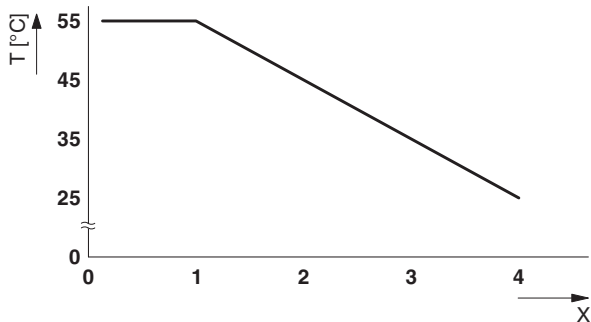


Figure 2 Derating without active convection

T [°C] Ambient temperature of the station in °C
 x Number of active channels



Ensure sufficient convection Active convection can render derating unnecessary.

5.2 Drift response

| Output range | Drift (maximum) |
|----------------|-----------------|
| 4 mA ... 20 mA | ±100 ppm/K |

5.3 Tolerances influenced by electromagnetic interference

| Type of electromagnetic interference | Standard | Typical deviation in % |
|--------------------------------------|--------------------------------|------------------------|
| Electromagnetic fields | EN 61000-4-3/ IEC 61000-4-3 | < ±1.0 % |
| Fast transients (burst) | EN 61000-4-4/ IEC 61000-4-4 | < ±1.0 % |
| Conducted interference | EN 61000-4-6/ IEC 61000-4-6 | < ±1.0 % |

The typical deviation refers to the output range final value.

6 Internal circuit diagram

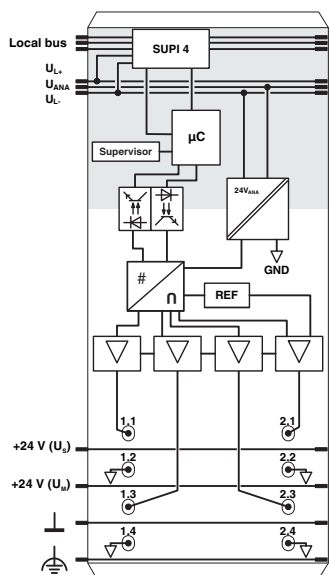











Figure 3 Internal wiring of the terminal points

Key:

| | |
|---|---|
|  | Protocol chip |
|  | Microprocessor |
|  | Hardware monitoring |
|  | Optocoupler |
|  | Power supply unit with electrical isolation |
|  | Digital/analog converter |
|  | Reference voltage source |
|  | Output amplifier |
|  | Electrically isolated area |

7 Electrical isolation

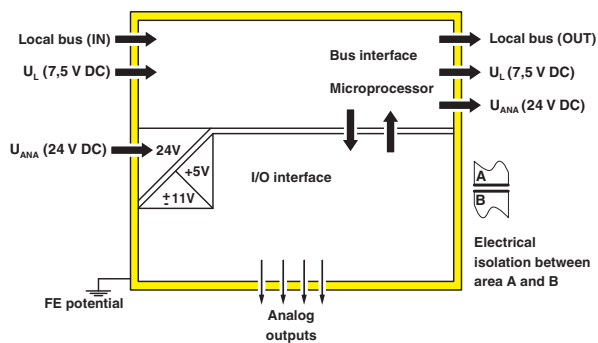


Figure 4 Electrical isolation of the individual function areas

8 Terminal point assignment

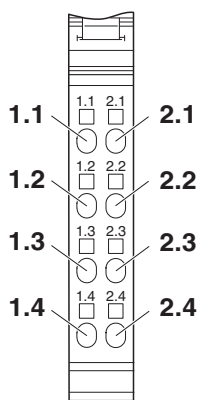


Figure 5 Terminal point assignment

| Terminal point | Signal | Terminal point | Signal |
|----------------|--------|----------------|--------|
| 1.1 | OUT01 | 2.1 | OUT02 |
| 1.2 | GND01 | 2.2 | GND02 |
| 1.3 | OUT03 | 2.3 | OUT04 |
| 1.4 | GND03 | 2.4 | GND04 |

OUTx (x = 01 ... 04) Channel x current output
 GND Reference potential

9 Connection example

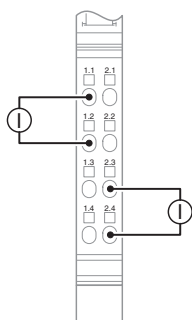


Figure 6 Actuator connection

10 Installation instructions

High current flowing through potential jumpers U_M and U_S leads to a temperature rise in the potential jumpers and inside the terminal. To keep the current flowing through the potential jumpers of the analog terminals as low as possible, always place the analog terminals after all the other terminals at the end of the main circuit (for the sequence of the Inline terminals: see also IL SYS INST UM E user manual).

11 Connection notes

Always connect the analog actuators using shielded twisted-pair cables.

Connect the shielding with the shielding accessories given in the ordering data.

12 Local diagnostic indicator



Figure 7 Local diagnostic indicator

| Designation | Color | Meaning |
|-------------|-------|-------------------------------------|
| D | green | Diagnostics (bus and logic voltage) |



For detailed information on diagnostics, please refer to the IL SYS INST UM E user manual.

13 Process data

The terminal uses four words of OUT process data.

Each channel is mapped to a word.

The output values are transmitted from the controller board or the computer to the module using process data output words.

Order of the process data words

| Word | 0 | 1 | 2 | 3 |
|--------|-------|-------|-------|-------|
| Signal | OUT01 | OUT02 | OUT03 | OUT04 |
| Value | AV01 | AV02 | AV03 | AV04 |

AV Analog value

The output values are depicted in standardized representation format.

In this format, data is standardized to the output range and represented in such a way that it indicates the corresponding value without conversion.

The output value is represented in 16 bits.

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| Analog value | | | | | | | | | | | | | | | |

14 Representation of the output values

| Output data | | 4 mA ... 20 mA |
|-------------------|-------------------------|-----------------|
| hex | dec | mA |
| 8001 | Output range overrange | +21.339 |
| 7FFF ... 43BC | 32767 ... 17340 | +21.339 |
| 43BB | 17339 | +21.339 |
| 3E80 | 16000 | +20.0 |
| 2710 | 10000 | +14.0 |
| 1770 | 6000 | +10.0 |
| 1388 | 5000 | +9.0 |
| 03E8 | 1000 | +5.0 |
| 0001 | 1 | +4.001 |
| 0000 | 0 | +4.0 |
| FFFF ... 8100 | -1 ... -32512 | +4.0 |
| 80FF ... 8000* | -32513 ... -32767 | Hold last value |
| 8080 | Output range underrange | Hold last value |

* without 8001, 8080



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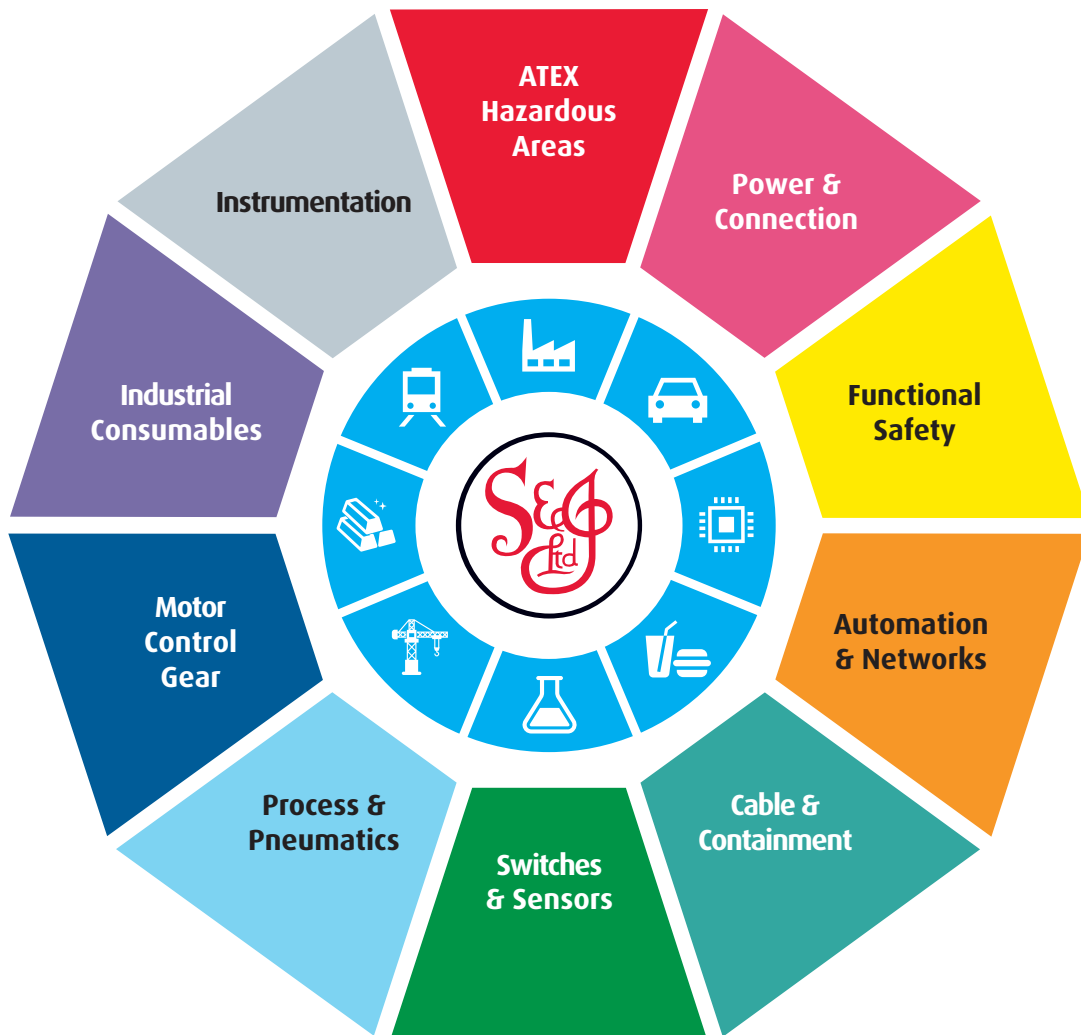
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